

Amendments to the Claims

- Sub B1
1. (Original) A cover for an image sensor array, the cover comprising:
a plate formed of substantially transparent material and placed adjacent to the image sensor array, said plate having a plurality of surfaces forming a lensing structure, such that at least one of said plurality of surfaces is contoured into a lensing surface capable of changing imaging characteristics.
 2. (Original) The cover of claim 1, wherein said plate is made of a transparent material which is one of glass, plastic, or plexiglass, said plate being transparent over all, or a substantial portion of, the image sensor array.
 3. (Original) The cover of claim 1, wherein said lensing structure is made of at least one lensing element, said lensing structure covering all or a substantial portion of the image sensor array, such that said at least one lensing element is formed on the lensing surface.
 4. (Original) The cover of claim 3, wherein said at least one lensing element is a refractive lensing element.
 5. (Original) The cover of claim 4, wherein said refractive lensing element includes a concave lens.
 6. (Original) The cover of claim 4, wherein said refractive lensing element includes a convex lens.
 7. (Original) The cover of claim 4, wherein said refractive lensing element forms a post having at least one lensing surface.
 8. (Original) The cover of claim 3, wherein said at least one lensing element is a diffractive lensing element, said diffractive lensing element blazed on the lensing surface.

9. (Original) The cover of claim 3, wherein said at least one lensing element is a hybrid refractive-diffractive lensing element, said hybrid lensing element being formed with a diffraction grating blazed on the refractive lensing surface.

10. (Original) The cover of claim 1, wherein said lensing structure is a mounting structure formed on the lensing surface of the plate for attaching additional lensing elements to the plate.

11. (Original) The cover of claim 10, wherein said lensing structure also includes an alignment mark, formed on the lensing surface, to guide the additional lensing elements when attaching to the plate.

12. (Original) The cover of claim 10, wherein said mounting structure is formed by a mesa-like protrusion on the lensing surface.

13. (Original) The cover of claim 10, wherein said mounting structure is formed by a ringed-wall structure having an inside wall and an outside wall, said ringed-wall structure formed on the lensing surface.

14. (Original) The cover of claim 13, further comprising a threaded retaining ring on the inside wall for firmly attaching the additional lensing element to the plate.

15. (Original) The cover of claim 13, further comprising a threaded retaining ring on the outside wall for firmly attaching the additional lensing element to the plate.

16. (Original) The cover of claim 13, wherein said mounting structure is formed by a well-like depression on the lensing surface.

17. (Original) The cover of claim 16, further comprising a threaded retaining ring on the inside wall of the depression for firmly attaching the additional lensing element to the plate.

18. (Original) The cover of claim 3, wherein said lensing structure is a hybrid of lensing elements and mounting structures for additional lensing elements.

19. (Original) The cover of claim 18, further comprising an alignment mark formed on the lensing surface to guide the additional lensing elements when attaching to the plate.

20. (Original) A lensing structure coupled to a cover for an image sensor array, the structure comprising:

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an element made of substantially transparent material and having a lensing surface, said element formed on or with the cover, such that said lensing surface of said element changes the incoming light.

21. (Original) The structure of claim 20, wherein the lensing structure and the cover is injection molded into a single-piece cover plate.

22. (Original) The structure of claim 20, wherein the changing includes said element functioning as an additional lensing element.

23. (Original) The structure of claim 20, wherein the changing includes said element functioning as a mounting structure or alignment marks to attach other lensing elements to the cover.

24. (Original) The structure of claim 20, wherein the image sensor array is a charge-coupled device sensor array.

25. (Original) The structure of claim 20, wherein the image sensor array is an active pixel sensor array that has a follower transistor and a selection transistor in each pixel.

26. (Original) An image sensor camera system for converting optical data into digital image data, the system comprising:

an image sensor array having a plurality of sensors, said sensors operating to receive the optical data and integrate the data into electrical charge proportional to the amount of optical data collected with a particular period of time;

a lens system operatively coupled to the image sensor array and configured to carry and focus the optical data onto the image sensor array, said lens system including a plurality of lenses and a cover plate, said cover plate contoured into a lensing structure that changes an imaging characteristic; and

sensor electronics coupled to the image sensor array, and configured to receive the electrical charge, the sensor electronics operating to convert the electrical charge received by the plurality of sensors into the digital image data.

27. (Original) An active pixel sensor system having an active pixel array, the system comprising:

a lensing element configured to receive optical data and change an imaging characteristic, said lensing element providing cover for the active pixel array.

28. (Original) A method of contouring an image sensor array cover plate for imaging improvement or enhancement function, the method comprising:

forming a lensing structure on a lensing surface of the cover plate by contouring said lensing surface of the cover plate into a lensing element.

29. (Original) The method of claim 28, wherein forming a lensing structure includes blazing diffraction grating on said lensing surface.

30. (Original) The method of claim 28, wherein said lensing structure is attached to said cover plate.

31. (Original) The method of claim 28, wherein said lensing structure and said cover plate are injection molded as a single-piece structure.

32. (New) An image sensor device, comprising:
a package for an image sensor chip including first surfaces sized to hold an image sensor, and second surfaces located to cover the image sensor, said second surfaces forming a lensing structure which is contoured to change imaging characteristics of incoming radiation which impinge towards said first surfaces.

33. (New) A device as in claim 32, wherein said second surfaces also form a support surface sized to hold an assembly including additional lensing structures.

34. (New) A device as in claim 33, wherein said additional lensing structures include a multiple piece lensing structure which collectively with said second surfaces forms an overall lensing operation for radiation to be sent to said image sensor chip.

35. (New) A device as in claim 34, wherein said multiple piece lensing structure includes three lens parts.

36. (New) A device as in claim 35, wherein said multiple lens system includes a convex lens, a first Plano convex lens, and a second Plano convex lens.

37. (New) A device as in claim 33, wherein said support surface includes screw threads.

38. (New) A device as in claim 37, wherein said additional lensing structures include a threaded ring.

39. (New) A device as in claim 32, wherein said second surfaces form a concave lens part.

40. (New) A device as in claim 32, wherein said second surfaces form a convex lens part.

41. (New) A device as in claim 32, further comprising an image sensor chip held by said first surfaces.

42. (New) A device as in claim 41, wherein said image sensor device includes an image sensor array.

43. (New) An image sensor device, comprising:
an integrated circuit image sensor;
a package for holding the image sensor; and
a cover part which covers the integrated circuit image sensor, wherein said cover part includes a lensing element formed thereon.

44. (New) An image sensor device as in claim 43, wherein said lensing element includes at least one of a refractive lensing element or a diffractive lensing element.

45. (New) An image sensor device as in claim 43, wherein said integrated circuit image sensor includes an active pixel array.

46. (New) A lensing structure for an image sensor array, comprising:
a cover plate, having a first flat surface part in a first area, and a post extending from said first flat surface part, said post including a lensing part located at a top portion and effecting incident light passing through the lensing part.

47. (New) A lensing structure as in claim 46, wherein said lensing part at the top portion thereof is formed as a concave lens structure.

48. (New) A lensing structure as in claim 46, wherein said lensing part at the top portion thereof is formed as a convex lens structure.

49. (New) A lensing structure as in claim 46, further comprising an image sensor located under the post.

50. (New) A lensing structure as in claim 49, wherein said image sensor is located directly under said post.

51. (New) A lensing structure as in claim 50, wherein said image sensor is located directly under said post, and areas underlying said image sensor have a lower overall height than a height of said post.

52. (New) A method of making a camera system, comprising:
contouring a cover plate to form a lensing structure; and
covering an imaging array with said cover plate, said cover plate being placed in an optical path of said camera system.

53. (New) A method as in claim 52, wherein contouring the cover plate to form the lensing structure includes forming at least one of a refractive lens or a diffractive lens.

54. (New) A method as in claim 52, wherein covering the imaging array with said cover plate includes locating said cover plate adjacent said imaging array.

55. (New) A method as in claim 52, further comprises locating at least one additional lensing element in said optical path of said camera.

56. (New) A method as in claim 55, wherein said at least one additional lensing element is mounted to said cover plate.

57. (New) A method for controlling Petzval field curvature in a camera system, comprising:

contouring a cover plate to form a lensing structure; and
covering an imaging array with said cover plate, said cover plate being located adjacent said imaging array in an optical path of said camera system.

58. (New) A method as in claim 57, wherein contouring the cover plate to form the lensing structure includes forming at least one of a refractive lens or a diffractive lens.

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59. (New) A method of forming a digital image comprising:
focusing incident light on an imaging array by passing the light through a lensing element formed in a contoured cover plate;
receiving the light as optical data with said imaging array;
integrating the optical data into electrical charges using sensors in the imaging array;
and
receiving the electrical charges with sensor electronics and converting the electrical charge into digital image data.

60. (New) A method as in claim 58, wherein said lensing element is formed to include at least one of a refractive lens or a diffractive lens.